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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 09/779,437 | 02/09/2001 | Alfred A. Barney | 01997-286001 | 6675 |

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| EXAMINER |
|---|
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| ART UNIT | PAPER NUMBER |
|---|---|
| 2859 | 8 |

DATE MAILED: 09/20/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. 09/779,437 | Applicant(s) BARNEY ET AL. | |
|---|---|---|---|
| | Examiner Mirellys Jagan | Art Unit 2859 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *7/29/02* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-50* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-50* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

## DETAILED ACTION

### *Comments*

This is a Supplemental Detailed Action providing a corrected version of the Detailed Action that was filed 9/13/02. The Notice of References Cited [PTO-892] of the Office Action filed 9/13/02 should be considered with this Supplemental Detailed Action.

### *Claim Objections*

1. Claims 35 and 36 objected to because of the following informalities: There is lack of antecedent basis in the claims for "the pressure-sensitive composition" and "the porphyrin", respectively. Appropriate correction is required.

### *Claim Rejections - 35 USC § 103*

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-23 and 49 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 5,986,272 to Britton, Jr. et al [hereinafter Britton] in view of Bruchez.

Britton discloses a method of measuring temperature utilizing a temperature-measuring apparatus having:

a temperature sensor that is luminescent,

a light source for illuminating the sensor, and

a detector that detects the light emitted from the sensor [the light emitted from the sensor has an intensity that is dependent on the temperature of the surface upon which it is placed, which allows for determining the temperature of the surface],

wherein the method of measuring temperature has the following steps:

providing a temperature sensor on a surface of a substrate, the temperature sensor being a coating that is luminescent when irradiated with an excitation wavelength of light,

irradiating a portion of the temperature sensor with an excitation wavelength of light,

detecting emission of light from the sensor, and

determining the temperature from the emission of light from the sensor.

Britton does not disclose the temperature sensor being a semiconductor nanocrystal in a binder [i.e., matrix].

Bruchez discloses that a semiconductor nanocrystal in a binder is luminescent when irradiated with an excitation wavelength of light. The semiconductor nanocrystal includes a group II-VI, III-V, or IV semiconductor, such as ZnS, ZnSe, ZnTe, CdS, CdSe, CdTe, HgS, HgSe, HgTe, GaN, GaP, GaAs, GaSb, InN, InP, InAs, InSb or a mixture thereof, surrounded by an overcoat of a second semiconductor material. A coat of an organic or inorganic overlayer (capping agent) surrounds the nanocrystal, the overlayer having a moiety that has an affinity for the nanocrystal surface and a chosen solvent [i.e., binder] such as an inorganic or organic polymer. The overlayer is used to convey solubility in order to disperse the coated nanocrystal into the chosen solvent and can have a hydrolyzable moiety. The semiconductor nanocrystal is a member of a substantially monodisperse core population that emits light in a spectral range of

no greater than 75nm at FWHM and exhibits less than a 15% rms deviation in diameter with a particle size in the range of about 15 to 125 Å.

Referring to claims 1 and 15, it would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize the semiconductor nanocrystal in a binder, as disclosed by Bruchez, as the luminescent coating in the temperature-measuring apparatus disclosed by Britton, since these coatings are alternative types of luminescent coatings that can determine the temperature of a substrate.

Referring to claims 7 and 20, the use of the particular type of hydrolyzable moiety claimed by applicant, i.e., a metal alkoxide, absent any criticality, is considered to be nothing more than a choice of engineering skill, choice, or design because the use of the particular moiety claimed by applicant is considered to be nothing more than the use of numerous and well known alternate types of hydrolyzable moieties that a person of ordinary skill in the art at the time the invention was made would have been able to provide using routine experimentation in order to provide a hydrolyzable overlayer on the nanocrystal as already suggested by Britton and Bruchez.

Referring to claim 13, the semiconductor nanocrystal disclosed by Britton and Bruchez inherently have a quantum efficiency of at least 10%, since the applicant states in the specification that the semiconductor nanocrystals of the same type as those disclosed by Britton and Bruchez have quantum efficiencies of greater than 10% (see page 4, line 14).

Therefore, in utilizing the temperature-measuring apparatus disclosed by Britton and Bruchez to measure temperature, the method steps of claims 1-14 and 49 would inherently be followed.

4. Claims 24-33, 35, 36, 39-48, and 50 are rejected under 35 U.S.C. 103(a) as being unpatentable over the published article titled "Application of Temperature Sensitive Paint for Detection of Boundary Layer Transition" by Popernack et al [hereinafter Popernack] in view of the published article submitted by Applicant titled "Oxygen Quenching of Luminescence of Pressure Sensitive Paint for Wind Tunnel Research" by Gouterman and Bruchez.

Popernack discloses that temperature sensitive paints are used to measure the temperature of a surface. The temperature sensitive paint is applied evenly to a surface to produce a thin coating and has a light-emitting element that emits light when excited by a light source. The intensity of the emitted light is detected to determine the temperature of the surface (page 78, left column, first and second full paragraphs).

Popernack does not disclose the ingredients of the paint, i.e., having a binder and a solvent, or the light-emitting element being a semiconductor nanocrystal.

Gouterman discloses a luminescent material mixed with a paint having a binder and a solvent. Gouterman discloses that most paints are generally made from a binder, a volatile solvent, pigments [optional], and additives. Gouterman also discloses that adding a pressure-sensitive element such as a platinum porphyrin to paint will allow the pressure on a surface to be measured.

Bruchez discloses that a semiconductor nanocrystal is a light-emitting element when irradiated with an excitation wavelength of light. The semiconductor nanocrystal includes a group II-VI, III-V, or IV semiconductor, such as ZnS, ZnSe, ZnTe, CdS, CdSe, CdTe, HgS, HgSe, HgTe, GaN, GaP, GaAs, GaSb, InN, InP, InAs, InSb or a mixture thereof, surrounded by

an overcoat of a second semiconductor material. A coat of an organic or inorganic overlayer (capping agent) surrounds the nanocrystal, the overlayer having a moiety that has an affinity for the nanocrystal surface and a chosen solvent [i.e., binder]. The overlayer is used to convey solubility in order to disperse the coated nanocrystal into the chosen solvent. The semiconductor nanocrystal emits light independently of oxygen pressure and is a member of a substantially monodisperse core population that emits light in a spectral range of no greater than 75nm at FWHM and exhibits less than a 15% rms deviation in diameter with a particle size in the range of about 15 to 125 Å.

Referring to claims 24 and 32, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the paint disclosed by Popernack by making the paint of a binder and a solvent, since Gouterman discloses that paints are generally made from a binder and a volatile solvent.

Furthermore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the temperature-sensing paint disclosed by Popernack by replacing the light-emitting element with the light-emitting element disclosed by Bruchez, since these elements are alternative types of light-emitting elements that can be used to determine the temperature of a surface.

Referring to claim 39, the use of the particular type of volatile solvent claimed by applicant, i.e., an alcohol, absent any criticality, is considered to be nothing more than a choice of engineering skill, choice, or design because the use of the particular solvent claimed by applicant is considered to be nothing more than the use of numerous and well known alternate types of volatile solvents that a person of ordinary skill in the art at the time the invention was

made would have been able to provide using routine experimentation in order to make a temperature-sensitive paint as already suggested by Popernack, Gouterman, and Bruchez.

Therefore, in utilizing the device disclosed by Popernack, Gouterman, and Bruchez to measure the temperature of a surface, the method steps of claims 45-48 and 50 would inherently be followed.

5. Claim 34 is rejected under 35 U.S.C. 103(a) as being unpatentable over Popernack, Gouterman, and Bruchez, as applied to claims 24-33, 35, 36, 39-48, and 50 above, and further in view of the published article titled "Pressure and Temperature Measurements with a Dual-Luminophor Coating" by Carroll et al [hereinafter Carroll].

Popernack, Gouterman, and Bruchez disclose a paint having all of the limitations of claim 34, as stated above in paragraph 4, except for the paint also having a pressure-sensitive composition that emits light dependent upon the oxygen pressure when irradiated by light.

Carroll discloses paint with two light-emitting elements, one for determining the temperature of a surface and the other for determining the pressure on a surface. Carroll discloses that it is beneficial to provide both a temperature-sensitive element and a pressure-sensitive element in paint in order to measure both the temperature and the pressure of a surface and to correct for temperature effects on the pressure-sensitive element.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the temperature-sensing paint disclosed by Popernack, Gouterman, and Bruchez by adding a pressure-sensitive element to the paint, as disclosed by Carroll, in order to determine both the temperature and pressure of a surface.

6. Claims 37 and 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Popernack, Gouterman, and Bruchez, as applied to claims 24-33, 35, 36, 39-48, and 50 above, and further in view of the prior art disclosed by applicant on page 8, lines 27-29 of the specification [hereinafter Prior Art].

Popernack, Gouterman, and Bruchez disclose a paint having all of the limitations of claims 37 and 38, as stated above in paragraph 4, except for the binder including an organic or an inorganic polymer.

The Prior Art discloses that it is well known [typical] to use an organic or an inorganic polymer as a binder in paint.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the temperature-sensing paint disclosed by Popernack, Gouterman, and Bruchez by using an organic or an inorganic polymer as the binder in the paint since the Prior Art teaches that using such a binder in paint is well known.

### *Response to Arguments*

Applicant's arguments with respect to claims 1-48 have been considered but are moot in view of the new ground(s) of rejection.

### *Conclusion*

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

The following patent discloses measuring pressure on a surface:

U.S. Patent 5,341,676 to Gouterman et al

U.S. Patent 5,341,676 to Schwab et al

The following patent discloses temperature-sensitive paints:

British Patent 2283752 to Dunleavy et al

The following patent discloses fluorescent nanocrystals:

U.S. Patent 6,319,607 to Barbera-Guillem et al

The following publications disclose temperature-sensitive paints:

"An Optical Technique for Detecting Fatigue Cracks in Aerospace Structures", Banaszak, D. et al., Instrumentation in Aerospace Simulation Facilities, 1999. ICIASF 99, pp 27/1-27/7, 14-17 June 1999, Toulouse, France.

"High Temperature Surface Measurements Using Lifetime Imaging Of Thermographic Phosphors: Bonding Tests", Allison, S.W. et al., Instrumentation in Aerospace Simulation Facilities, 2001. 19th International Congress on ICIASF 2001, pp. 171-176, 27-30 Aug. 2001, Cleveland, OH, USA 2001.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mirellys Jagan whose telephone number is 703-305-0930. The examiner can normally be reached on M-F 8:30-4:45.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Diego F Gutierrez can be reached on 703-308-3875. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7725 for regular communications and 703-308-7725 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

mj
September 7, 2002

**Diego Gutierrez**
**Supervisory Patent Examiner**
**Technology Center 2800**